Nevin Yang. Exploring the Effects of Searcher-Social Source Relationship When Seeking Information Online. A Master's Paper for the M.S. in I.S degree. April, 2012. 61 pages. Advisor: Robert Capra.

Finding information has become an essential skill in daily life, and people often turn to other people for assistance in finding information. This research study explores the effects of social source composition when seeking information online, and the decision process on selecting social sources, a human information source used by a searcher to help with an information need that may affect the search process, to collaborate with when searching. One-on-one interviews with graduate students were conducted and common characteristics and themes emerged. Effect on the information need and the search process caused by the relationship between the searcher and social sources were observed. The factors of trust, familiarity, and authority in the social source impacted the information seeking process in areas of communication, information sharing, and information need. Despite the observed effects of searcher-social source relationship, success in satisfying an information need appears unaffected by relationship.

Headings:

Collaborative Search

Information Retrieval / Social aspects

Online Searching

EXPLORING THE EFFECTS OF SEARCHER-SOCIAL SOURCE RELATIONSHIP WHEN SEEKING INFORMATION ONLINE

by
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A Master's paper submitted to the faculty
of the School of Information and Library Science
of the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements
for the degree of Master of Science in
Information Science.

Chapel Hill, North Carolina

April 2012

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Table of Contents

Introduction

With the rapid development of online search engines, information has never been more available at a searcher's fingertips. However, this abundance also has a dark side for searchers in the form of information overload and frustration of keeping up with new hardware and software. Searchers must sift through large amounts of information, gradually discover relevant information, and then complete a task. Information retrieval (IR) and information seeking (IS) systems have typically been designed for individual searcher without much regard to tapping into the power of the searcher's community. When seeking information, people often tap into a number of people's knowledge and consolidate information from multiple sources on their information horizon to complete a task for non-work purposes (Savolainen, 2008). Human sources were observed to be most significant in early phases of information seeking during Savolainen's (2008) study followed by networked sources such as websites or e-mail. Collaborative search is an approach designed to combines these two sources into one IR system to help the searcher most effectively complete an information seeking task. The idea has been around since 2003 in Barry Smyth's paper on collaborative web search. The major commercial search engine, Google, has attempted to incorporate the social aspect in search with their "+1" feature in which Google users can "+1" a page to indicate their recommendation of a web site. Collaborative search attempts to create context for a query by incorporating preferences from a specialized community of like-minded users.

The current state of knowledge in the collaborative search area does not appear to focus much on how the different compositions of a searcher's social network affect information seeking. There has been a great deal of research on collaborative search and the benefits compared to traditional Web search. A searcher's information pathway usually first comprises of social sources that the searcher feels can help them with an information need. However, there has not been a critical analysis of what relationship these people have to the searcher and how the different social relations influence the information seeking process.

Searchers often request help from other people as a major source when satisfying an information need. However, there is a noticeable lack of exploration of the relationship these other people have with the searcher. The scarcity of research on what type of relationship a person has to a searcher when acting as an information source is one I hope to help rectify. Understanding how other people help a searcher successfully satisfy an information need could greatly improve how online search works today.

Library and Information Science (LIS) researchers and system designers would most likely be interested in this research as their involvement in the search space would benefit from a more detailed understanding from how the social context affects information seeking. Although other people have been identified as important sources during the information seeking process, current online search studies do not readily reflect this aspect of the nature of a source's connection to the searcher. Finding out more about the effects of social connections through this research will help LIS researchers better understand collaborative information seeking as well as helping

systems designers to create products that leverage these social connections to improve information seeking.

This study will contribute to existing knowledge of collaborative search by exploring who a searcher contacts in an information seeking context. This research will also help generate more attention on the long-ignored aspect of interactions with other individuals during an information seeking process. The information seeking process is not a solitary endeavor undertaken by a single individual; rather, the process is a dynamic set of events that transforms with every interaction the information seekers has with other individuals. This paper will explore the effect of these various social sources consulted when a searcher conducts an online information seeking task.

My study will attempt to address the following research questions:

1. How do people engage in collaborative search?
2. Why would people collaborate instead of searching alone?
3. How does the relationship between a searcher and social sources affect the information need and the search process?

Literature Review

Introduction

Information retrieval today encompasses a multi-disciplinary approach as information grows ever more abundant. Searchers suffer from information overload and frustration with technology as they attempt to sift through large amounts of information before eventually discovering relevant information to satisfy an information need. People often follow a process of social search where they tap into social resources to help filter through the information overload and find the information they need (Morris, Teevan, & Panovich, 2010).

When looking for information, we often consult people we know as sources of information to help us achieve our information need, whether as domain experts or to help discuss concepts among other reasons. Who we consult during these information seeking tasks varies widely depending on the topic. Many current studies do not discuss or analyze how the collaborative information seeking process is affected when the searcher consults different people with varying levels of familiarity. Other people that a searcher consults have been identified as important information sources during the information seeking process and newer information seeking models reflect growing recognition of this importance. My study will help contribute to the existing literature by attempting to discern some general effects that the searcher-social source relationship has on the information seeking process.

Knowledge of whether social sources are important can help drive further product innovation in spaces other than search, where social context has already been added such as Google +1 and Bing with Facebook Friends. In a survey, Morris et al. (2010) asked participants if they have "ever cooperated with other people to search the Web." Over half of the respondents in a collaborative web search survey said they explicitly collaborated at least once a month on an online search, and one quarter of those respondents admitted to collaborating weekly on search tasks (Morris et al., 2010). The researchers actually believe the figure was underestimated as subsequent questions revealed that only 2.9% of respondents did not engage in any of the sample collaborative search activities listed in the study, such as messaging other people to coordinate search or working together in person to suggest alternative query terms. Understanding the effects of these social searches in online information seeking can help establish a precedent such that other fields can also attempt to leverage the beneficial effects of social context. It can also help provide further evidence for designers to create information retrieval systems that support collaborative behavior and take into account the different relationships other people have with the information seeker.

To put the research into the social source composition during information seeking in context, there is a need to start the discussion by looking at an overview of how searchers decide on sources of information, how group dynamics play a role in search, and a variety of individual types of searching to better understand search with a social context.

Source Preferences

When seeking information, searchers often consult two sources to help navigate through the vast amount of information available online—human sources and networked

sources. Human sources were favored most strongly as sources of problem-specific information because other people "were praised for their capacity to provide filtered and experience-based information about the problematic issue at hand" (Savolainen, 2008). This suggests that human sources are extremely important in the information seeking process, and a greater understanding of these sources could help us design systems that tap into these resources more effectively. Savolainen (2008) does not explicitly define networked sources but it appears to be sources involving electronic means of accessing information through the Internet as his examples are "e-mail; mailing lists; WWW." He also refers to networked sources as the Internet when discussing findings regarding the preference criteria of source types. Savolainen (2008) found that networked sources were mentioned less frequently than human sources but still occupied a significant position on the information horizon. It is not clear if this trend still exists because technology, along with usage and attitude toward technology, rapidly evolves and the state of technology may be very different compared to when Savolainen's study was conducted in 2008.

A study regarding group member familiarity suggests the familiarity a person has with their human resources may play a role in the information seeking process despite not affecting the performance of successful task completion (Janssen, Erkens, Kirschner, & Kanselaar, 2007). Janssen et al.'s 2007 study illustrates the existing work in the area that this study hopes to contribute to and was constrained by the fact that all participants were 11^{th} grade high school students who were already in class together. The type of relationship would most likely vary greatly despite most group members being classmates with just differing levels of familiarity, but the relationship dynamics were not explored in-depth. My study adds some initial explorations into how relationship

dynamics affect the information seeking process on top of what Janssen et al. (2007) have already discovered.

However, the study's observations on the effects of familiarity provide some valuable insights into its potential effects on the effect of social sources during information seeking. Higher levels of familiarity did result in other positive effects. Janssen did witness that higher familiarity led to more critical and exploratory perceptions, more positive perceptions and less negative perceptions. Higher familiarity also acted as a significant predictor for several collaborative activities, such as social support and social resistance messages within group communication. It also led to significantly less administrative activities, such as monitoring of task activities and task-related questions, so members could focus on their tasks rather than the logistics of collaborating. Using the above-mentioned observations regarding familiarity as a basis, it is likely that the social sources will have an effect on a person's information seeking process.

One significant piece of the group member familiarity study was its usage of a survey technique to measure group members' familiarity with each other rather than asking for self-identified relationships (Janssen et al., 2007). The survey had its own questions and guidelines for measuring familiarity based on the answers which helps ensure that the students do not inconsistently identify their relationship with others using inconsistent terminology. This type of familiarity measure was drawn from a previous work (Adams 2005) and would be useful to implement in studying the effects of social sources as there is an independent metric to gauge the relationship between a searcher and the consulted social sources. This study similarly leveraged the familiarity measure

from Adams's work in 2005 with some differences which are explained in the methodology section.

Modes of Information Seeking

Existing research has examined some aspects of my proposed research question but does not observe the question in its entirety. Evans and Chi's model of social search appears to be the closest to capturing the social relationships between searcher and human information sources through interactions but still fails to identify and assess the relationship of these consulted social sources with the searcher. Evans and Chi (2008) define social search as "an umbrella term used to describe search acts that make use of social interactions with others. These interactions may be explicit or implicit, co-located or remote, synchronous or asynchronous." The model provides an integrated model of social search, specifically noting where and why social interactions occurred before, during, and after a search event. Social search refers broadly to the process of "finding information online with the assistance of social resources, such as by asking friends, reference librarians, or unknown persons online for assistance" (Morris et al., 2010). The term essentially combines Savolainen's (2008) idea of human information sources and networked sources into one information retrieval approach to help a searcher most effectively succeed in seeking information.

Marchionini's (2006) idea of exploratory search blends "querying and browsing strategies from retrieval that is best served by analytical strategies" and encompasses two information-seeking activities: the learn and the investigate tasks. First, the learning task involves multiple iterations and return sets of objects that require cognitive processing and interpretation. The second type of task, investigative tasks, requires substantial

extant knowledge and aim to allow the searcher to analyze, synthesize, and evaluate results. This model of information seeking views the search problem "from the vantage of an active human with information needs, information skills, powerful digital library resources situated in global and locally connected communities—all of which evolve over time" (Marchionini, 2006). Although it lacks the social context, exploratory search should be considered another type of search. However, it is especially pertinent to my study as I believe that consulted social sources will have an effect on the information seeking process by helping to iteratively refine all aspects of the process over time through these consultations.

Collaborative search is inherently social as it is collaboration between multiple people seeking information for a shared goal. Collaborative systems can be classified along four dimensions: intent, depth of mediation, concurrency, and location (Golovchinsky, Qvarfordt, & Pickets, 2010). The study also identifies a number of roles a person may play in a collaborative search: peer, domain novice/expert, search novice/expert, prospector, and a miner. These roles are further discussed in the analysis section of my study and used to help classify human sources in my study along with the measure of familiarity from the group member familiarity study (Janssen et al., 2007). These dimensions help differentiate information seeking systems, and the classification helps establish characteristics to identify in systems and consider how to enhance collaboration. This study helps frame my research but is not as appropriate as a social search model because collaborative search assumes that people are always collectively working together to search for information (Golovchinsky et al., 2010). The difference is that this research focuses on how human information sources affect an individual's

information seeking process rather than how group dynamics play a role in a collaborative effort. Social search can be considered as a subset of collaborative search in this context. Golovchinsky et al. (2010) also recognize that existing tools do not effectively support ad hoc collaboration common in a variety of information seeking situations. This research will help to provide evidence related to this collaborative context and drive more thoughtful product design that takes into account the social dynamics of a collaborative search.

These models of information seeking acknowledge that human information sources are utilized in an information seeking task, but they do not specifically examine how the relationship plays an effect on the process despite identifying the significance of social sources. My research will primarily discuss relationships at a level of "friend" or "professor" rather than in a role such as "prospector," but Golovchinsky et al.'s roles (2010) will also be discussed. Like most current research in information seeking, these works do not delve into the effects different types of individuals have on search and instead generalize all human information sources into a black box that searchers may use for help during search.

Common Types of Searches

In "Taxonomy of Web Search", (Broder, 2002), the author classifies web queries into 3 classes: (1) navigational, the immediate intent to reach a particular site; (2) informational, the intent to acquire some information assumed to be present on more web pages; and, (3) transactional, the intent to perform some web-mediated activity. Informational searches (59.3%) seem to be the most common type of search online compared to 28.0% navigational and 12.7% transactional (Evans & Chi, 2008). After

successfully finding information, 72% of searchers take action, either to organize or distribute the information, but a significant number, 28%, do not act on that information any further and end the search process there.

These query types are helpful, but there is a need to understand common collaborative information seeking tasks as well to help describe what a searcher is intending to accomplish. The top three most popular task descriptions include travel planning (27.5%), general shopping tasks (25.7%), and literature search (20.2%). The remaining five task descriptions are also significant but not as common: technical information (16.5%), fact finding (16.5%), social planning (12.8%), medical information (6.4%), and real estate (6.4%) (Morris, 2008). The knowledge of common information seeking tasks will help focus the research into tasks most relevant to searchers and help further unravel a person's complex information seeking process. Do people consult diverse social sources for different types of information needs? What are the effects of these differing social sources on different types of information needs, if any observable impact exists? For example, if I consult my parents about buying a house, how is their effect on my information seeking process different compared to if I asked a friend when both social sources have comparable domain expertise? A shared understanding of popular types of information seeking tasks helps to ensure higher relevance for future researchers to build upon this exploratory study.

Directly Related Research

A Master's student from the University of North Carolina at Chapel Hill has explored a similar topic of group relationships in collaborative exploratory search. In Shelby's 2011 Master's Paper, "Sensemaking and Group Relationships in Collaborative

Exploratory Search," she focuses on collaborators rather than an information seeker tapping human information sources and how that dynamic affects the search. Shelby's main contributions to this field are her observations that collaborators expanded and narrowed each other's information seeking processes by contributing information and direction as well as alleviating anxiety over uncertainty in the process (Shelby, 2011). She built upon a previous study regarding group member familiarity (Janssen et al., 2007) by also looking at trust between the collaborators. This study also draws some of the familiarity concepts presented regarding measuring group member familiarity from Janssen et al.'s 2007 study.

Summary

After reviewing the current pertinent literature related to my research topic, I recognize the limitations that exist in the area of social sources and information seeking. The goal of my research study is to contribute to the current body of knowledge by providing an exploratory study of how a searcher's relationships with people who act as sources of information affect the information seeking process. Research has suggested a heavy preference of searchers to utilize human information sources during information seeking and that the familiarity level with social sources may play a role in the process as well. Like Janssen et al.'s 2007 study, this study uses a biased sample of graduate students to address research questions because of time constraints. Many of the current modes of information seeking identify human information sources during the search process but do not delve into the details of the relationship between searcher and consulted social source. To research this question, knowledge of different types of

searches and common information seeking tasks will help set boundaries for where the effects may show.

Applying the benefits of understanding the effects of various social sources based on a searcher's familiarity with the social source may extend beyond the information seeking process and may possibly be generalized to sensemaking and decision making as well. The focus in this study is to begin to explore the nature of the relationships of human information sources with the searcher so that the results may spur further study and help refine existing information seeking models.

Methodology

Goals of the Study

The goals of this research study were to gain a better understanding of:

1. How do people engage in collaborative search?
2. Why would people collaborate instead of searching alone?
3. How does the relationship between a searcher and social sources affect the information need and the search process?

Method Description

For this study, semi-structured interviews were conducted face-to-face in a quiet, semi-private room with graduate students enrolled in the University of North Carolina at Chapel Hill who have experience with searching online electronically and have asked other people for help during an online search that lasted multiple days or weeks. Semi-structured interviews are interviews with "predetermined questions, but the order can be modified based upon the interviewer's perceptions of what seems most appropriate" (Wildemuth, 2009, p. 233). During the interview, question wording may be changed and explanations given. Particular questions which seem inappropriate with a particular interviewee may be omitted, or additional ones included as well (Wildemuth, 2009, p. 233).

Conducting a semi-structured interview after the tasks are completed is appropriate for qualitative studies such as this study, especially when participants cannot

be directly observed (Creswell, 2009, p. 179). Semi-structured interviews display the researcher's awareness that individuals understand the world differently and depending on the person, some questions may need probing and elaboration (Wildemuth, 2009, p. 233). Wildemuth (2009) describes this type of interviewing as involving "less rigidity and more leeway than structured interviews but are more organized and systematic than unstructured interviews in developing the conversation" (p. 233). Consistency is ensured across interviews through the use of an interview guide to provide structure and predetermined questions. An interviewer may probe beyond a participant's answers to predetermined questions adapted to a given situation to uncover a deeper understanding. This method is especially appropriate for my research problem as the collaborative information seeking process is difficult to examine in a lab setting, and an information need requiring collaboration may span days, sometimes weeks. Asking participants to reflect on their experiences will help ensure that the whole collaborative process can be captured in a short period of time.

Population and Sampling

The nonprobability sampling approach in this research was used by first considering this study as an extensive study intending to discover common properties of or patterns that hold within a population (Wildemuth, 2009, p. 129). Convenience sampling, a form of nonprobability sampling, was chosen because of time constraints; this approach is a recruitment process where researchers recruit people because they are available. Inclusion and exclusion criteria will still be imposed on the population of interest from this sample to specify who is eligible. Wildemuth (2009) states the selection process helps "balance the convenience of recruitment with an attempt to match

population definition" (p. 121). As this is an exploratory study with a time constraint, a small sample size will still allow me to achieve the research goals previously stated. A sample size of six participants was ultimately chosen after sending out a recruitment email using the University of North Carolina's (UNC) mass mailing system (https://notify.isis.unc.edu/massmail/).

Identifying and recruiting participants first started with a careful definition of the population of interest. As convenience sampling is a nonprobability sampling approach, there were some differences between the target population and the study population (Wildemuth, 2009, p. 117). The target population is defined as adults in the 18-60 age range who have experience in searching while cooperating with others to resolve an information need. The study population was defined as graduate students enrolled at UNC-Chapel Hill. This population will be expected to have experience with computers and collaborative searches, such as travel planning, general shopping tasks, literature search, or social planning (Morris, 2008).

The primary researcher was responsible for the recruitment process and corresponding with the potential participants through e-mail and phone. Recruitment for this study was conducted by sending out a recruitment email through the School of Information and Library Science's graduate student mailing list and UNC's mass mail system (https://notify.isis.unc.edu/massmail/), which reaches students who have chosen to receive informational emails. Although requests to local acquaintances, friends, and family were considered, there was no need as the study's time constraints prevented an increase in participants. The eligibility criteria for participating in this research require participants to: (1) be at least 18 years old; (2) speak English fluently; (3) and, have

collaborated previously to complete an information need in multiple occasions within the past two years. A financial incentive of $10 cash was given to participants upon the completion of the interview. The incentive would have been pro-rated for the time the participant spent during the interview should the participant decide to quit. For example, if the participant withdrew after half of the interview was completed, the participant would receive half of the incentive. However, all participants completed the entire interview so pro-rating the financial incentive was unnecessary.

Study Procedures

After potential participants expressed interest in participating in the study, they were contacted through e-mail to arrange for an available time to be interviewed on UNC's campus, and to answer any questions they had about the study. Participants were allowed to bring any material or devices they wanted to refer to when discussing their collaborative search experiences. Once the participant arrived to the pre-arranged interview location at the mutually agreed upon time, general information regarding the study was explained to them. A consent form was also signed by the interviewer and interviewee prior to the interview or audio recording starting. After the written consent, the audio recording device was turned on and set to record, and the interview began. For the interview itself, the study followed the interview guide's structure and questions. The interview was heavily influenced by Creswell's (2009) suggested interview protocol which includes the following structural components: a heading, interviewer instructions to ensure standard procedures across interviews, the questions (including an ice-breaker, main questions, and followed by concluding statement or question), probes to follow up and ask individuals to elaborate, space between the questions to record responses, and a

final thank-you statement to acknowledge the time spent by participant (Creswell, 2009, p. 183). In this study, there was no extra space between questions as the responses were only recorded through the audio recording device and not through interviewer notes. Interview length for the study ranged from thirty minutes to a little under one hour per participant.

Interview Guide

The interview guide proposed for use during the study is included in Appendix B. The questions were developed through a combination of reviewing relevant literature and considering the research objectives driving the study. The interview guide was further refined after receiving feedback from my research advisor.

The interviews began with an icebreaker which consisted of introductions and exchanging pleasantries. This initial portion of the interview was not recorded as the consent form was signed at the end of this section. Once the consent form was signed, the audio recording and research interview began. The recorded interview started with questions regarding the interviewee's background in search, familiarity with people consulted for help during search, collaborative search, and comfort with technology. The interviewer then asked the participant to describe two collaborative search experiences and provided examples for collaborative search, examples were collaborative task descriptions drawn from the most popular topics in Morris's 2008 study, so the participant could better understand our definition of collaborative search. The example first given to the participant was one involving travel planning with friends as travel planning was the task described most often in the Morris 2008 study. Another example provided to a participant was one discussing purchasing clothes or a car and consulting

other people during the process as general shopping tasks was the second most frequent topic (Morris, 2008). Through discussion with the interviewer, two recent experiences that the participant felt comfortable to describe were identified where both instances were a self-motivated task but with different purposes (e.g., one with an academic purpose and one for travel). Then, the interviewer asked a series of framing questions about each experience, including a question intended to reveal level of familiarity on a 4-point scale with the people consulted drawn from an Adams study in 2005, with the goal of collecting data to reveal insights into the study's primary research questions. Unlike the Adams study (2005) where four questions were included to prompt the participant to consider other members of the group in the context of previous team or project situations, this study only used the one-item question of a subjective assessment of familiarity for the people consulted. Some possible framing questions about a search experience are what was the information need or why did you have this information need. The interviewer continued by asking more detailed questions regarding the collaboration to try to elicit more discussion regarding communication channels, choice in methods, the collaboration aspect of the experience, and who in particular the participant consulted. Once these questions had been answered, the process repeated again for the second identified search experience. Upon completion of the second set of questions, wrap-up questions were asked, such as asking participant to reflect on their overall collaborative search experience and to contrast their two experiences. Finally, the interviewer thanked the participant for taking the time to participate in the interview and offered the $10 cash incentive for successfully completing the interview.

Ethical Issues

A possible issue was the confidentiality of data—participants were informed that their personal information would not be made public unless they volunteered to do so. No participant decided to make their personal information public, and data was encrypted using TrueCrypt, an open-source encryption software application. Another possible ethical issue was the possibility of personal, intimate information being disclosed during the data collection process (Creswell, 2009, p. 91). The privacy of the participant was protected and this protection was conveyed to all participants.

Data Collection

The data was collected by the interviewer who is also the primary researcher. The interview was recorded using a digital audio recorder for the duration of the interview that was later transcribed using "paraphrased transcription" in which the entire interview was not transcribed, only points considered significant by the researcher. During the interview, hand-written notes were not taken by the interviewer as writing was considered to be detrimental to a smooth interview. After the interview was finished, the researcher took general notes regarding the interview overall that may not be apparent in the recording. The collected data was analyzed with themes centering on the research questions, especially collaborative search and how a social source's relationship plays into that process. It was done electronically to allow for easier organization and iterating revisions of the data.

The questions asked during the semistructured interview were all from the interview guide. The icebreaker question allowed the interviewer to build rapport with the interviewee. Asking about an interviewee's background helped frame the discussion, especially in regards to gaining insight into the strength of the relationship between

searcher and social sources, and informing the interviewer of what probing questions that may be helpful later on. After the background, the interviewer asked questions relevant to the research questions to try to collect data to infer themes and build common characteristics across interviews. The questions regarding collaboration were especially helpful for observing common concepts. Repeating the questions when inquiring about two search experiences with different social sources helped explore the effects of a relationship between the searcher and the social source on a search by providing a larger number of experiences.

Data Analysis

The data analysis started with a basic qualitative analysis format of (1) collecting qualitative data, (2) analyzing it for themes or perspectives, and (3) reporting major themes shared across the data, usually four to five. After transcribing the interviews and analyzing the collected data, inductive coding was used to elicit themes and common characteristics among the different experiences discussed. Given the difficult process of coding by hand, a computer was used as it "may be faster and more efficient than hand coding" (Creswell, 2009, p. 188). Computers more easily facilitate the tasks of comparing different codes, locating all passages coded the same, and determining whether participants are responding to a code idea in similar or different ways. No qualitative data analysis tool was used, such as NVivo or ATLAS.ti, because the low number of participants resulted in a manageable volume of data collected, and, therefore, such a program did not offer as much benefit considering the learning curve required to utilize it effectively.

Benefits and Limitations of Methodology

The study method focusing on qualitative interviewing has benefits and limitations (Creswell, 2009, p. 179). Regarding the benefits, interviewing is useful when participants cannot be directly observed, and they can also provide historical information. Interviewers can control the line of questioning, so they may keep the focus of the interview on topics related to the research. Regarding limitations, the data provided by interviewing is indirect information filtered through the views of interviewees. It is also in a designated place rather than the natural field settings. Additionally, the presence of a researcher may bias responses compared to if the searcher was freely discussing experiences. Not all participants will be equally articulate and perceptive. For this study, there is also a possibility of the participant learning the questions when discussing their first search experience and then continuing on the second one. It may introduce some bias to the second set of answers as they will begin to think of their search experience as framed by the first experience's discussion.

Steps were taken to ensure that the data is collected reliably (Creswell, 2009, p. 190). The paraphrased transcripts were checked to make sure the documentation does not contain obvious mistake made during transcription. Validity was addressed primarily through the strategy of making sure the data will be interpreted using rich, thick descriptions to convey the findings; the description "may transport readers to the setting and give the discussion an element of shared experiences" (Creswell, 2009, p. 192). An additional strategy was used for addressing bias by asking participants to discuss experiences one after another in quick succession to hopefully prevent any participant being biased from their previous responses.

Results

Overview

A total of twelve search experiences were collected through semistructured interviews as each of the six participants in the study discussed two experiences. Each of the six participants referred to an academic experience, which is likely a side effect of the participant selection used for the study. Graduate students were recruited, and graduate students often have to write a thesis or pursue research in a field they are interested in. This common trait of graduate students was reflected in their choice in types of experiences to discuss during the interviews. In addition, participants were asked to discuss a second experience, and for the second experience, they were mostly considered under the umbrella of personal searches and there was more variety in information needs such as shopping, travel, event planning, or a hobby. One of the six participants did not discuss a personal search for his second experience; he instead discussed a work-related experience. It was still considered a self-motivated information need as he "really thought this would be a way for the community to thrive." When discussing the social information source that participants consulted during their search process, I use the terms "social source" and "collaborator" interchangeably as the consulted people fulfilled both roles in this study.

Participant Search Background

As preliminary questions, participants were asked how often they asked others for help when searching for information, their comfort level on finding information online, and if they had a preference in who they chose to collaborate with online. All six participants responded that they asked others for help frequently—at least once or twice a week. One participant also added that she asked others for help much more often when she was younger, but she still asked for help fairly frequently. Another participant also felt that he asked others more often when it was an ongoing information need of personal interest, specifically music in his case.

All six participants expressed confidence with finding information online and felt "fairly comfortable" or "pretty comfortable." One especially confident participant expanded by saying he "does not feel uncomfortable at all" when looking for information online. One participant did specify that there was less comfort with academic searches and would be a "4-5 on a 10-point scale." Another participant also provided a cautionary tone and clarified her comfort level by saying there may be trouble if there was a lack of context regarding the information need.

Regarding collaboration preferences, five of six participants said they had "no preference" with collaboration, and there was one that did state a preference. This participant said he would not want to collaborate with his professor online because his professor "had a special rule of not more than one email per day." "When I am trying to get into a conversation with him, I try to do it face-to-face," this participant elaborated.

Search Experiences

	Information Need	**Relationship**	**Familiarity**	**Length**
Participant 1	Group project	Classmate Classmate Classmate	2 1 1	3 weeks
Participant 2	Dissertation	Professor Professor Former Supervisor	2 2 3	3 months (9 months)
Participant 3	Literature review	Professor	2	8 months
Participant 4	Graduation requirements	Advisor Registrar Classmate	2 1 3	3 months
Participant 5	Literature review	Advising professor Professor Wife Classmate	2 2 4 4	1 month (6 weeks)
Participant 6	Dissertation	Professor Professor Roommate	2 3 4	6 months

Table 1. Academic searches.

	Information Need	**Relationship**	**Familiarity**	**Length**
Participant 1	Shopping	Close Friend	4	1 week
Participant 2	Shopping	Husband Mother-in-law Father-in-law	4 3 3	1 month
Participant 3	Travel planning	Boyfriend	4	3 weeks
Participant 4	Social planning	Close friend Roommate	4 4	2 weeks
Participant 5	Work-related	Boss Coworker Coworker Dad Coworker	2 3 2 4 1	6 weeks
Participant 6	Music	Friend	4	3 days

Table 2. Personal searches

In the tables above, the amount of time in parentheses under the column "Length" indicates the expected total time needed to satisfy an information need that was ongoing

but not yet unfinished. Familiarity was measured by a participant's self-reported value using a 4-point scale with 4 being "know this person very well" and 1 being "hardly know this person."

The twelve search experiences the participants were asked to discuss were self-motivated and they typically leveraged their social information sources' knowledge for other resources to discover further sources of information and increase their knowledge. In Table 1, two important differences between the academic and personal search experiences emerged during the interviews. First, in the academic searches, the searcher often had a lower level of familiarity with their collaborator(s), who were also considered social sources of information in this study, on average compared to when their information need was personal instead of academic. Four of six participants had no collaborator with a familiarity of 4, the highest, in their academic searches, but these same four participants would collaborate with a person of the highest familiarity in their personal searches. Second, participants typically consulted more people as information sources if their information need was academic—about three people on average for academic searches compared to about two people for personal searches. Third, academic search experiences tended to be of greater length, an average of 14.5 weeks in search duration, compared to the personal search experiences, an average of 2.75 weeks in search duration, perhaps because of external pressures and factors not explored in this study. The study's eligibility criteria for participants included experiences that were multiple days or weeks, and it seemed that participants focused on a similar timeframe for the personal search experiences. The similarity of personal search experience length to the criteria may have been a biased result of specifically requiring participants to

describe an experience with a duration of multiple days or weeks to participants. However, for academic information needs, five out of six participants did report a length of one month or greater for their information seeking process. The difference in search length between academic and personal may be due to the different scope in the information needs. Academic searches tended to be comprehensive literature reviews whereas personal searches consisted of information needs that lent themselves to being more quickly resolved. The increased expectations of an academic information need may also play a role in the increased length as the searchers were graduate students who needed to deliver a finished product to a professor.

The information need descriptions for personal searches were categorized using the popular task descriptions from a previous study that discovered frequent collaborative tasks (Morris, 2008). Morris's popular task descriptions, in order from most popular to least popular, included travel planning, general shopping tasks, literature search, technical information, fact finding, social planning, medical information, and real estate. Two of the information needs, finding music and work collaborations, did not seem to fit in any of Morris's popular task descriptions, so generic terms were utilized to describe those information needs.

Of the six personal search experiences discussed, only two participants shared a similar information need of shopping as shown in Table 2. There was a mix of information needs that drove the experiences the participants chose to discuss. The four personal searches out of six listed in Table 2 involved at least one social source where the searcher had a familiarity level of 4 (4 was the highest, "know this person well") with the collaborator, although the relationship varied between significant other, friend, or family.

Three of six personal searches only involved one other collaborator, while the remaining three experiences had a group size ranging from two to five other collaborators. There seemed to be no relationship between the difference in group sizes and the length of an information need or between the type of information need and group size. The participants also stated that they did not contact any other people even as information sources other than the collaborators listed.

Level of Familiarity

There was a notable difference in the levels of familiarity between academic search experiences and personal search experiences reported by the participants. For the academic searches, participants had an average familiarity of 2.35 with their social sources. For the personal searches, participants had an average familiarity of 3.23 with their social sources. Although it is unclear if the observed difference is statistically significant due to the small number of participants, the metric provides insight on the overall difference in familiarity of information sources that participants consulted. The increased average familiarity for the personal searches could be because of extra social factors where the increased familiarity results in increased desire to help the searcher resolve an information need. Social factors may also be involved--the collaborator does not want the searcher to think they are unhelpful. No collaborators were interviewed about their experience in helping the searcher.

Despite the difference in the reported levels of familiarity between academic and personal searches, the level of familiarity that participants had with their social information sources did not seem to have any effect on the perceived success of satisfying an information need. This finding warrants further research because the study

did not have the resources necessary to ask participants to complete a specific collaborative task and compare the results. The self-reported success and levels of familiarity were only their subjective appraisal of the collaborative search experience and their relationship without any metrics implemented to measure the success or relationship.

Reasons for Collaboration

Five of six participants revealed that there was no requirement to collaborate with the people they chose to consult in order to satisfy their information needs. However, they chose to collaborate rather than search in isolation because they believed cooperating with others was "very helpful." One participant even described the cooperation as crucial and it was "probably the most important thing I've done so far by just being able to get their [his social sources] input." A participant shared the positive sentiment and said the voluntary decision to collaborate "was more of a personal desire to find things faster. It was not a requirement at all… I could have done it on my own—slowly and just as good." One participant espoused the benefit from collaborating of figuring out the initial steps to satisfying an information need:

> *I wouldn't know where to start. It would be really hard not to work with them when they have so much more experience in this area. They can help me find sources to do some initial research.*

There were often additional cues that informed the participant that this person in particular may be helpful in quickly finding more information regarding their information need. These additional cues would not be possible without the searcher having an established relationship with the social source prior to the information need.

> *The purpose wasn't collaboration in the beginning…. I talked with him [my colleague] because whenever we're on Facebook, I always see his particular*

> *Facebook page giving out these Spotify updates. That really told me he was really into music… I thought he would be a good person to talk to.*

Three of the six participants actually considered the cooperation with others unhelpful at times because of the overhead involved in collaborating, even though they might have considered their overall collaborative search experiences successful. One participant thought it was less helpful to collaborate because she had to cater to other people's desires as well. Another participant agreed by saying that it was "more for the project" rather than a collaboration borne out of the desire to improve the information seeking process. A third participant believed that the consulted information source should take a more active role in helping her with her information need:

> *It was kind of unhelpful… after he gave me the journals to look through and a few books, other than that, I kind of disseminated the research in the articles that were out there and kind of did most of the work on my own.*

Collaborative Communication

	Email	**Face-to-face**	**Phone**	**Text Message**	**IM**
Search experiences	8	9	4	1	1

Table 3. Communication methods.

Search experiences may involve multiple communication methods; therefore, the total number of communication methods reported in Table 3 may be greater than twelve, which was the total number of experiences. The reported communication methods showed a preference for synchronous communication through face-to-face, phone, and instant message (IM). Synchronous communication was useful because it allowed for real-time collaboration, especially in the face-to-face situations. Collaboration using synchronous communication was used sporadically during the information seeking process for searchers, and these checkpoints helped ensure that searchers were

progressing toward resolving their information need. Despite the perceived necessity of synchronous communication to verify successful progress, the bulk of the information seeking time was conducted asynchronously where participants collected information and then presented it in some form to their collaborators, such as in notes, a document, or a conversation piece. One participant said her group emailed PowerPoint presentations to each other with "one person in charge of putting them all together. Another participant said that she liked to print out abstracts and references and show them to her professor to receive feedback and make progress in her information need. Technology limitations also played a role in the choice for communication methods. One participant said that her mother-in-law lacked Internet skills, which suggests a social aspect of preference in choice of communication methods. She did not force her mother-in-law to use her preferred communication method of email as she knew that her mother-in-law would have trouble with that method of communication. Relationship with the social source seems to have affected the choice in communication method as well for three of the six participants. One participant said "with my classmates and wife, it's been more conversation-based" because he felt more familiar with them. Another participant mentioned a preference for email but did not use it because "that's just something I sorta know—that's not how they like to communicate."

Asynchronous communication methods of email and text message were still significant methods, and in some cases they were preferred over real-time, synchronous communication. One participant chose text message over email because "it's easier to text with friends than it is to email… emails can take forever." The participant felt that phones were better method of getting in contact with her friends because her social circle

used phone calls and texting to contact each other instead of other methods like email. Calling or texting also has more noticeable notification to a person such as ringing or vibrating compared to email where the participant has to intentionally have the email application open to view new emails.

When communicating during the information seeking process, the data was compiled in many different formats that the searcher felt was most appropriate for the information need. For the music search, data was shared in the form of a YouTube playlist. Music videos that the collaborator believed the searcher would be interested in were added to a YouTube playlist and then the playlist link was shared to the searcher. The searcher then went through the playlist and discovered artists to listen to after watching the music videos. When looking for information for a dissertation, participants compiled their collected information in a Word document. One participant said he "wrote down the publication, the author, and the title of the article, so [he] can go back to it and reference it." The compilation of data for a particular information need may transform afterwards to accomplish a goal that was not discussed in the interview. The same participant just mentioned said that after he compiled references for articles relevant to a literature review, he will eventually compile all the data in a PowerPoint presentation and discuss it with his professor. For some information needs, there was no specific method of documentation, and the participant may just keep all the data collected during the information seeking process mentally with little to no physical records.

Effects of Relationship on Search Process

Participants were asked how they felt about the relationship with their social sources affected the search process and the way they shared information. Participants

were also asked whether they felt that their relationship with social sources posed any challenge to the information seeking process. Five of the six participants felt there was an effect on the search process or sharing during the process because of their relationship with their social source. Participants were directly asked during the interview if they believed their relationship with their social sources affected the search process. Most of the participants did not feel like the relationship with their social source posed an obstacle, but one participant did believe that there was a challenge because of the relationship. He thought that his relationship with his professor was "a little more formal than between me and my roommate." He elaborated further on the challenge:

> *This affects the collaboration in a very nuanced, qualitative way. I would just call my roommate or just knock on his door… while with my professor, I would write a little more formally and more politely. It was more time-consuming and formal [to talk with professor].*

When discussing the personal search experiences that tended to be more personal, participants decided to consult social sources that they were more familiar with, as noted previously in the average level of familiarity of 3.23. This suggests that when people conduct more personal searches, people tend to turn to those that they are familiar with despite one participant saying "it was just response time… relationship didn't really matter." When including the academic searches, participants still felt that relationship had an effect, which sometimes manifested in ways such as previously mentioned as an obstacle. Although one participant felt that there was no major effect due to the relationship with her social sources in her two experiences, the remaining five participants all stated that they believed there was some form effect directly caused by the relationship on the information seeking process.

One participant felt the close relationship (familiarity level of 4) with her boyfriend in particular affected sharing because she shared more with her boyfriend than she would with others, especially during face-to-face conversations regarding the information need.

> *I would've shared more of my apprehension over how much money it was; I definitely share more with him than I share with others … We have a more intimate relationship. We have a very open and honest relationship so if I felt that anytime I didn't want to go, I could've definitely shared it with him.*

A second participant agreed that close relationships (familiarity level with her two collaborators were 4) affected sharing during the information seeking process because she felt more at ease:

> *[I was] probably a lot more laid back in how I communicated information. [I] didn't feel the need to be as detailed … as long as they had the broad strokes of what we were doing and the time, that was sufficient.*

A third participant expanded on the trend as possibly having a proximity effect on top of relationship:

> *[There was] more sharing when I was more familiar. Similarly with my own roommate, I would share more between us because we would also meet face-to-face everyday so that also creates a context.*

The difference in position authority and knowledge caused each of the six participants to be more conscientious of their communication with their social sources, especially in cases of professors. One participant said he "would probably be more specific with my professors than with friends or family" because "they would understand a little more and they're interested in those specifics." A different participant confessed that with her professor, she was "more interested in being seen academically and more concerned with being well-written." She was also concerned with "social desirability—I want my professor to see me in certain ways." Another participant agreed with this

notion and its effect on her information seeking process because she was “kind of less demanding and more subservient [compared to with her boyfriend] because I know I don’t want to make waves… I want to be on his good side.”

Discussion

Overview

This study aimed to explore whether there was an effect of the relationship between a searcher and their consulted social sources of information and what some of the effects were if discovered. The interviews questions were designed to elicit information regarding group collaboration sparked from a singular person's information need. Through the interviews, the study explored how people engaged in collaborative search, why people collaborate instead of searching alone, and how the relationship between a searcher and consulted social sources of information affected the initial information need and the information seeking process. Several themes and common characteristics emerged from analyzing the results above, related to the process of information seeking in collaborative search experiences.

Overall, participants responded that they consulted other people frequently, at least once or twice a week, which contrasted with previous findings of only 25.7% of people collaborating on a weekly basis (Morris, 2008). The study population may be biased because graduate students conduct regular collaborative searches borne out of academic information needs, but their ease in discussing other, more personal, search experiences suggests that people may be beginning to collaborate more frequently. Morris's 2008 study had a population where only 38% were considered researchers, but this study's population had 100% who could be considered as researchers due to their

graduate curriculum. This bias toward researchers may have also have affected their comfort level with searching online as graduate students frequently search online for information and demonstrate greater proficiency in seeking information online compared to other populations of greater age or groups that may show less proficiency or frequency due to the digital divide.

How do people engage in collaborative search?

The first research question of this study was to discover more information on how people engaged in collaborative search. After data analysis, some general components emerged from how participants conducted their search. Participants would start out with an information need, individually conduct basic searches to get an overview of the information need, decide to consult other people, choose their social sources (collaborators), glean knowledge relevant to the information need or information seeking process from the collaborators, communicate to collaborators, share data with the collaborators, and then compile the data into a meaningful form to satisfy their information need. The common steps the participants undertook do not reflect the entirety of their information seeking process as the study focused on the collaborative aspects of the search and the searcher's relationship with social sources. However, it is a rough approximation for their information seeking process. After analyzing the data and generalizing the steps that the participants used, the steps seemed to match Evans and Chi's (2008) social search model. Overall, participants followed the social search model outlined by Evans and Chi (2008); their common steps above mirrored the model's steps of identifying an information need, gathering requirements, formulating representation, foraging, sensemaking, and then taking action. The goals behind the information need

were not explored in this study. For example if the information need was to find a dress, the goal of why the participant wanted the dress or for what purpose was not investigated in-depth.

In Golovchinsky's (2009) study, he proposed a taxonomy to classify the relationships between the searcher and the collaborators. *Peers* are collaborators that use their system independently and combine their results manually. *Domain experts* are variations on the peer role where the collaborator has expert knowledge in the domain of interest and can provide more relevant information. *Search experts* are collaborators with a higher degree of expertise or familiarity with search tools and can give search tips to make searching more efficient. A *prospector* generates many queries to explore a collection and identify a few relevant documents before using a new query. A *miner* discovers more details on documents identified by the prospector's queries. Prospector and miner parallel the search expert and domain expert roles but focus on decomposing the information seeking task into subtasks rather than being driven by a searcher's knowledge. In this study, participants tended to consult social sources that fulfilled the roles driven by a person's knowledge, domain expert especially. There were also a few cases where participants consulted a social source that was a search expert. One participant said his classmates "are the ones who are able to help with navigating the more academic sites to make the search a little bit easier. There were cases where collaborators could be considered simply peers, such as a group project. The group project had four people, and the participant explained that the information need was divided up such that every person played a role of peer. I would not classify them as

miners because there was no person that played the prospector role to provide the miners with queries to discover more detailed information.

Participants primarily used email and face-to-face to communicate with collaborators. No existing collaborative tool was mentioned by participants, such as online document sharing (e.g., Google Docs), video conferencing (e.g., Skype video chats), or screen sharing (e.g., remote desktop). The reliance on email and face-to-face methods may be due to a lack of existing systems that provide easy ways to collaborate between multiple people. Existing information retrieval systems are mostly geared toward individuals rather than groups collaborating to achieve a singular information need. Another possibility for participants refraining from using existing collaborative tools as mentioned above may be due to being unfamiliar and untrained in those types of collaborative methods. Using a new tool presents a barrier, even if small, that in a group setting may be challenging.

During the interview, participants were also asked if they could think of ways to improve collaborative tools so it would be easier to collaborate online. Participants recognized that there were issues with the collaboration tools available, but they have accepted the restrictions and do their best to work within the constraints. For example, one participant discusses an issue with email:

> *"If email didn't have miscommunication or technology didn't have the tendency to have some miscommunication, it'd be extraordinarily helpful. I wouldn't need to do face-to-face meetings [all the time] and everything could just be done."*

It is unclear whether their inability to suggest improvements lies in the fact that improvements to existing collaboration strategies have not been considered before, as one participant said, or that participants were truly satisfied with the current state of

collaborative tools available. Although participants were asked about improvement suggestions for collaborative search, they may not have been prepared to provide such suggestions in the few minutes allowed for the question during the interview to generate and express improvements.

Evans and Chi's (2008) model of social search is a good foundation to understanding the information seeking process that people undergo to satisfy an information need, especially in how a person engages in collaborative search (Evans & Chi, 2008). The model explicitly lists social interactions as methods of information exchange interwoven during different steps during each of the three major stages of search: before search, during search, and after search. The model is missing the social interaction during identification of an information need. Participants cited that their information need was refined and sometimes sparked by social interactions with the people they interacted with. What the model also lacks is the breakdown of social interactions and how the relationships with social sources in these roles impact the steps in the search process other than information exchange. This study has suggested that the social interaction between searcher and social sources has more effects than merely information exchange, so a more comprehensive model of information seeking should reflect that fact. Some of the effects of how the searcher-collaborator relationship has affected the search at multiple stages include the decision to collaborate before search and communicating and sharing information before search, during search, and after search. Therefore, this nuanced effect of relationships with social sources should be added to the model to better reflect the relationship's impact on the search process. The detailed effects of relationship themselves would be more suited for a separate model,

one that might include the roles in collaboration proposed by Golovchinsky (2009): peer, domain A expert/domain B expert, search expert/search novice or domain expert/domain novice, and search expert/domain expert.

Why would people collaborate instead of searching alone?

The second research question this study attempted to begin to answer was why people would collaborate instead of searching alone for their individual information need. Participants felt that collaboration had many benefits and their consultation of social sources affirmed Savolainen's (2008) concept of information pathway where people consult human sources and the Internet first that they feel can help them with an information need. Every participant stated that collaboration was their decision as it offered many benefits, including reducing search time, getting more diverse information, and helping refine the information need.

One finding of why people consult others instead of searching alone was the benefit of reducing time in searching and helping make information seeking more efficient. Participants learned from their social sources about more effective ways of searching by tapping into their social sources' knowledge instead of having to develop the knowledge individually. This observation appears to confirm the previous finding by Morris, Teevan, & Panovich (2010) that social resources help people filter through the information overload and find the information they need. One participant from this study emphasized the benefit of collaborating instead of searching alone especially during the before search stage (Evans & Chi, 2008):

> *I think collaborating and picking someone else's brain for information that you have is definitely a better way to go about it [searching] than just individually, even just asking other people where they started when looking for anything. If you have no idea where to start, then that even helps.*

Another finding was that people tend to collaborate with others to receive more diverse information as well. Consulting social sources served as a helpful method to get a diverse array of perspectives, and get a comprehensive set of sources about the information need at the same time. One participant further described this advantage of diversity emerging from collaboration:

> *I worked with [him] to brain storm some things to talk about… other people have the benefit of not being able to be attached to the project in any way so they can step back and say 'why are you even doing it this way?' Most of the time with those diverse perspectives, you get creativity and stuff like that… and it is really helpful.*

The relationship also had possible effects on the searcher refining the information need as the information seeking process progresses. One participant "didn't know any artist but was interested in world music, and then found out that [he] liked Middle Eastern music." This type of serendipitous discovery may not have come about unless the searcher had an existing close relationship with the social source. In one participant's search, the relationship affected the way she refined her information need, but in a different manner than the previous participant's music search. She wanted to take into account her friend's desires and needs, people she was close with and a familiarity level of 4. She emphasized "want[ing] to make sure my friends liked it." This subtle refinement of information need with familiar social sources due primarily to the relationship between searcher and social sources is another reason why searchers decide to collaborate. Searchers may sometimes cater to their social sources' desires and preferences along with their own information need.

A surprising finding emerged from the study where participants felt collaborating and consulting with their social sources did not actually increase the success rate of

satisfying their information need. Success was defined as the participant's subjective perception of whether the information need was resolved at the end of the search process. Rather, consulting others was a method used by participants to reduce the time spent during the information seeking process, but five of six participants believed they could have resolved the information need on their own without consulting social sources. Participants were confident in their ability to search, but they highly valued the ability to greatly reduce time with the help of more knowledgeable collaborators. This finding coincides with a previous study where the social sources play a role in affecting the information seeking process despite not affecting the success of task completion (Janssen, Erkens, Kirschner, & Kanselaar, 2007).

How does the relationship between a searcher and social sources affect the information need and the search process?

The primary aim of this study was to discover effects that the relationship between a searcher and social sources had on the information need and the search process. A number of factors were generalized after analyzing the interviews to making an impact, including authority, trust, and level of familiarity. These factors resulted in a number of observed effects as reported by the participants. Authority and familiarity affected the manner in which participants communicated to their social sources and also the frequency of communication. Trust was a factor in filtering the information received when collaborating and deciding who to consult for an information need. Ultimately, participants still prioritized the knowledge of their social source over their relationship and perceived effects of the relationship. One participant especially described the social source's knowledge as what went well with the experience:

> *Getting his knowledge to start with… and understanding where to look… and then kind of setting up the research questions… and setting up the background information for me that I didn't have that he has been working on… and has more knowledge about since he has been a [job title] before. He had a lot of different ideas where to go with the topic.*

For the academic search experiences, participants often had factors that influenced their information need that were not present with the other, more personal, search experiences. One such factor was authority. Many of the participants had deadlines with their academic search; although they could freely choose the topic that sparked their information need, they still had to report their findings and compile the collected data by a certain time. This relationship factor of authority affected the information seeking process in the searcher wanting to appear more professional. A participant described authority's effect: "I do see him as more knowledgeable and I don't want to point out his faults… definitely trying to go about it [the search] where I don't hurt the relationship." Another participant said that authority affected communication frequency as well because the participant did not feel comfortable communicating so often with someone who was his boss.

Participants highlighted trust and familiarity with a person as significant to the collaboration during the information seeking process. With more familiar social sources, which indicated a closer relationship, participants felt like they could be more informal and more relaxed. One participant described the relaxing effect, especially when position seemed to be important:

> *If I felt more familiar with people, I was more relaxed in how I asked questions and when I asked the questions. [It was] more not having to be the student, but could be easygoing and laidback in how I asked things.*

Trust in the social source appeared to be an important factor to the value placed in what help and information the social source provided back to the searcher. A participant clarified that "if I didn't know her, I would not have taken her suggestions as seriously." Trust also played a role in deciding who the participant consulted. One participant emphasized trust as a social source preference if his information need was considered important. He vaguely compared information needs and described his different expectations of trust:

> *When I do regular searching, say a restaurant or something, then I'll look at things like Yelp or just do general search for general reviews on that restaurant. If it's for school, I wouldn't do general. I would try to go to a trusted source.*

Despite many participants valuing trust, having a knowledgeable social source seemed to be more important than the level of familiarity with a person. One participant recognized "it probably wouldn't have mattered [who I asked], as long as someone had that information." As mentioned previously, five of six participants themselves acknowledged that collaboration did not seem to be a significant factor in successfully resolving an information need despite overwhelming praise for collaboration as very helpful.

Interviews with the participants resulted in an unexpected discovery that the relationship between searcher and social source may also change the relationship over the course of an information seeking task. One participant felt that a more personal information need helped to increase the level of familiarity with a person he talked to:

> *The basic change in our relationship was brought about by the knowledge that he knew a lot about music and the shared experience. After this particular search, we talk more often… That sharing brings us together more closely than it did earlier when we discussed academic stuff.*

Study Limitations

There were a number of shortcomings and limitations of the study that included the sampling approach, lack of standard experiences for participants to discuss, not asking for failed experiences as well, and the broad range of experience duration. The sampling approach provided the study with a very narrow group that could be expanded to include a more diverse study population. Since the participants were free to recall any two experiences with no constraint, implications of the data are weaker and it was harder to contrast the experiences between different participants to elicit the effects of the relationship between searcher and social source on the search process. The lack of constraints on experience length allowed participants to discuss experiences lasting longer than three months making the participants ability to recall the experience accurately less likely.

Conclusion

My goal in this study was to explore the nature of the relationships of human information sources with the searcher; more specifically, whether the relationship affected the information seeking process and what the effects were if they existed. Current literature recognizes the importance that other people play in the role of the information seeking process. Many models of information seeking, such as social search, exploratory search, and collaborative search, have been proposed but all fall short in describing the significance of the nuances a person's relationship may have on the original searcher's information seeking process. Many existing tools do not lend themselves to collaborative search either, so future research may need to look into new developments in the area of collaborative search and computer-supported cooperative work.

The study successfully showed that the relationship between a searcher and their social sources has an effect on the information seeking process, such as influences in the choice of social source, communication, sharing of information, and time spent on the information need. To explore the effects, the study asked participants to reflect on their search experiences. The questions were designed to elicit information regarding how people engaged in collaborative search, the decision to collaborate instead of searching alone, and how the relationship between a searcher and social sources affected the information need and the search process, if any effect existed. Some of the

observed effects are discussed in the study. Further study is required to measure whether the effect is significant across a larger population and if so, to propose an information seeking model which includes the impact of the relationship.

The study's findings highlighted the fact that people currently rely on email and face-to-face communication as the primary communication methods in order to share information and collaborate for online searches. This finding has implications on the design of information retrieval systems especially because people often turn to IR systems such as online search engines as one of the first steps during their information seeking process. Systems should support the ability for people to quickly and easily compile information, personally annotate concise bodies of information (e.g., personally summarizing a web page's content), and communicating this information to the collaborators. Having a system with all the above-mentioned functionality could reduce the added time in information seeking as people will not have to use multiple applications and duplicate the information to get feedback from their collaborators. One participant in particular suggested that collaborative search could improve if systems helped a searcher find social sources who had conducted a search on a similar information need and could access some form of content that contained what social source found during their own search process. For example, a public playlist on YouTube of a particular type of music would be helpful, but people often do not share these publicly.

All the participants believed that their overall collaborative search experiences were helpful. Furthermore, every participant reported that their collaboration with social sources resulted in more quickly satisfying their information need. If collaboration so

heavily impacts a person's search experience, there is even more reason to investigate the effects of the relationship between social sources and searcher in a future study.

If conducting future study into the effects of searcher-social source relationship on the information seeking process, I would suggest having participants either recall particular types of collaborative information seeking tasks or specify tasks for participants to conduct as part of the experiment and observe the experience. The free-form nature of this study and dependency on participant memory made it difficult to make statements about the data as the search experiences differed in so many ways and effects were subjective because they were collected from self-reported experiences rather than drawn from researcher observations. Further exploration of the social information source side is necessary as well instead of asking for experiences from the searcher's perspective alone. Identifying how important the information need is to the searcher seems to be another factor. One participant described the stake in the information need as playing a role: "music was not as urgent of an issue, so I could move slower and not suffer a cost from not finding things." Incorporating some of these suggestions in a future study could help reveal more valuable insights into this area so we can improve collaborative approaches, systems, and models.

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Appendix A – Search Strategy for Literature

My search strategy for discovering literature pertinent to my research question was to start with a keyword search using Google Scholar. Google Scholar's results included the major journals I expected to contain relevant literature, such as publications from the Association of Computerized Machinery (ACM), Computer-Supported Cooperative Learning (CSCL), or technical journals whose focus is on computers. I used Google Scholar to help guide my search, and I also looked through some keyword searches through the journal databases I found after my initial Google Scholar search. After I had found some articles relevant to my research question or its context that had been cited by more than 5 other articles, I decided to also look for more articles by looking at some of the referenced articles within the ones I had already found. I also talked to Dr. Capra, a teacher of my human-computer interaction seminar, because I know he was familiar with the collaborative information seeking field. He helped direct me to some further articles by giving me keyword suggestions to use when looking for articles online. I believe speaking with a knowledgeable source was much more useful than me blindly using keywords and perusing the many results returned from my inefficient queries. Most of the sources I used were scholarly articles I accessed through UNC's library e-subscriptions. I did not consider other sources, such as printed material or news articles, available through the School of Information and Library's library.

Appendix B – Interview Guide

Preliminary Questions

1. What year of school are you in and for what major?
2. How often have you asked other people for help when looking for information?
3. Could you please describe your comfort level in successfully finding information and with technology that supports it (e.g., using computers to search on the Internet)?

Background Questions

4. When looking for information, who do you turn to?
5. Are there some people who you collaborate with online and who you wouldn't? Why?
6. For the people you listed, could you please rate your level of familiarity with the person?
    a. This is using a 4-point scale with 4 being "know this person very well" and 1 being "hardly know this person."
        i. 2 is "know this person somewhat" and 3 is "know this person well."
7. Could you please discuss some recent experiences of when you worked together with another person or other people to find information over a couple of days or longer?

   a. We're especially interested in times where you felt that other people played a major role in shaping your information need. You would have to be the source of the original information need though. It would also be most helpful if it was done across multiple instances where you looked for it. For example, if you were planning a trip, you looked at flights one day and then tourist attractions the next day.
   b. Please think of at least one other time where you had another, different information need with people not from the first search experience. A little overlap would be fine, like if you always asked a person for help.
8. For the people you recall working with during the search, could you please rate your level of familiarity with the person?
   a. This is using the same 4-point scale as before with 4 being "know this person very well" and 1 being "hardly know this person."
      i. 2 is "know this person somewhat" and 3 is "know this person well."

Main Research Questions

From the above brainstorming, start by asking main research questions on the experience that the participant feels more comfortable in discussing.

9. Could you start by describing the background behind the instance in which you conducted a collaborative search?
10. How would you describe your information need?

11. Why did you start to collaborate with others instead of doing it alone?
12. Who did you work with? Were they an acquaintance, friend, family, etc.? How well did you know them?
13. Why did you decide to choose this person to help?
14. How did your relationship with that person affect the way you conduct your search?
15. Did your relationship affect the way you shared information? How?
16. What other ways did your relationship with that person affect your search? Why?
17. How did you tailor your collaboration with this person based on your existing knowledge?
18. How helpful do you think cooperating with others or asking for help from others was to finding the information you wanted?
19. Where did you look for information?
20. How long did this entire search process last?
21. Did you share information during the process with the people you consulted? If so, how did you communicate to each other?
22. Did you understand the information the other people shared with you? How did you include that to supplement what you already found or knew?
23. Can you describe how you compiled all the information accumulated during the search process?

24. Was there any trouble during the process because of your relationship with someone you asked for help in finding information?
25. Do you think your search would have been worse without someone that you consulted?
26. What do you think went well?
27. What do you think could've been better?

Follow up with second searching experience by repeating questions 5-27.

28. Do you think collaboration helps you more quickly satisfy an information need?
29. Looking back at the search experiences, would you have consulted other people instead?
30. Contrast the 2 different collaborative search experiences in terms of multiple factors other than just purpose, such as expectations, assumptions considerations, etc.

Probing Questions

31. I'm a little confused about that point. Can you please elaborate?
32. Could you please talk about that more?
33. That's interesting. Do you think you could go into more detail about what you just said?
34. What else did you do/consider?
35. Where were you when you collaborated with the other person or people?

Wrap-up Questions

36. How would you describe your overall collaborative search experience?
37. What do you think could improve current ways of collaboratively searching with others?
38. Is there anything else you would like to add that we haven't had a chance to talk about?

Appendix C – Recruitment Flyer

Do you often search for things? During that process, do you talk to other people to help with your search?

Want to earn $10 for just 1 hour of your time?
If so, we would love to talk to you!

A research study is being conducted to learn more about how people consult others when searching for information over the span of multiple days or more and how this collaboration affects their search experience.

You are eligible if you:

- A graduate student enrolled at UNC Chapel Hill
- Are at least 18 years old
- Speak English fluently
- Have searched online for something at least twice in the past 1 year using the help of other people across multiple days or weeks

If you meet the eligibility criteria and interested in participating in the study, please email:
collaborativesearchstudy@unc.edu

The study will be conducted between January 30, 2012 to March 31, 2012.

This study has been approved by the UNC Institutional Review Board, study #**12-0229**, and the principal investigator is Nevin Yang, a Master's student in the School of Information and Library Science.